After the 1983 Wildfire: the Anglesea Vegetation Regeneration Project – How it Grew

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Abstract
This paper describes how a long-term, low-cost study of the regeneration of vegetation in the Anglesea/Aireys Inlet region of the Eastern Otway Ranges, Victoria, following the devastating wildfire of February 1983 (Ash Wednesday) was organised and sustained over 10 years. The project was carried out entirely by volunteers and the results have now been published in the scientific literature. The study increased knowledge of the flora of the region and how it responds to wildfire. It also provided data to support submissions to protect, and preserve for the public, significant areas of indigenous local vegetation, as well as information to assist in the future planning of conservation management. (*The Victorian Naturalist* **117** (3), 2000, 96-106.)

Introduction

One February afternoon in 1983, shortly after the wildfires of Ash Wednesday (Rawson *et al.* 1983), three members of the Anglesea and Aireys Inlet Society for the Protection of Flora and Fauna Inc. (Angair) drove out into the hills north of Anglesea, Victoria. A blackened, silent landscape stretched as far as one could see in every direction. Stumps of Grass Trees *Xanthorrhoea* and charred trunks of eucalypts were all that remained of the heath woodland where Angair members had held a pre-Christmas picnic two months earlier. 'Well, things can only get better', said Carleen. 'Let's hope it rains soon', commented Mary. 'Why don't we document how it recovers', I suggested. Rain came three weeks later and everything sprang to life.

So began a scientific project carried out by amateurs. Its aims were to document the post-fire recovery of the main vegetation communities of the district, and obtain information for use in the planning of conservation management.

The project had several unique features: it was a natural experiment, as no attempt was made to modify the environment; it was long term, with the field work taking 10 years, and writing up a further five; all field work was carried out by volunteers; it was a low cost project, expenses averaging about $1,000 per annum; and results were published as four papers in the scientific literature (Wark *et al.* 1987, Wark 1996, 1997, 1999).

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Over the 15 years, data generated by the project was used by Angair to support its various campaigns to conserve and protect the local environment. The papers published gave the Society credibility and scientific authority when presenting its conservation strategies.

The project grew in size and scope with time, as did the number of people involved. Starting with an Angair group of four, who knew the local plants, it expanded to include a pool of over 150 volunteers of all ages. The project remained viable because it had both educational and social aspects; these were major strengths and helped keep the group of field workers together. Most of the participants knew Angair members and helping with the surveys became synonymous with a pleasant day or weekend at Anglesea/Aireys Inlet. The project was promoted as a fun learning experience, and a lot of effort put into sharing knowledge, providing volunteers with information about the local plants and the Anglesea area, and giving regular updates and feedback of results. The project created considerable interest within the local community and it also expanded the knowledge base within Angair, as more and more members became familiar with the local plants, and increasingly aware of environmental issues.

The project also remained viable because it was underpinned by Angair members with local botanical knowledge, training and time to organise the project and, when field work was finished, to complete the documentation and publication. It also

remained viable because there was adequate funding and support from professional scientists.

Initiation of the study

Before Ash Wednesday, Angair had never carried out a research project and its Committee voiced several concerns before final approval to proceed was given. Questions raised included: Did the Society have the expertise and the labour force to carry out a long term project? Who would plan the project? What would the project cost, and where would the money come from? Who would organise and control the project and do the final documentation? How could Angair ensure that the project produced useful published information?

Appointment of Project Consultant and Project Leader

The question of expertise was the first to be addressed. Were there sufficient skills within the Angair membership to carry out the project? The group was enthusiastic, but did the Society have sufficient knowledge of the local flora, training in scientific method and practical field experience to undertake the project?

There were at that time two Angair members with different skills which could be useful in the project. The Secretary, the late Mary White OAM, was a retired teacher who lived at Anglesea. Mary was an expert and respected field naturalist, skilled in plant identification and she knew the local indigenous flora well (White 1982), but she had little training in scientific method. I had scientific training, a background in botany and organisational skills, but no experience in field ecology. It was therefore obvious that professional guidance was needed and I suggested to Angair that the Society appoint a project consultant to review Angair expertise, oversee preparation of a project plan, guide the project initiation phase and later review progress. It was crucial that the project be correctly planned from the start, otherwise Angair would not obtain useful publishable information. Dr David Ashton (Ecologist and Reader in Botany, University of Melbourne) was contacted and agreed to act as project consultant on an honorary basis. I was appointed Project Leader, reporting to the Angair Committee.

The Project Plan

A formal project plan was developed between February and April 1983. It gave the Angair Committee a clearer idea of what might be involved, and helped me prioritise tasks. The plan gave historical background, defined aims and methods, and proposed a tentative budget for the 10 years.

It was decided that canopy and understorey recovery would be studied using permanent quadrats. Surveys would be carried out in spring and autumn for each of the first three years after fire and then in spring in later years. At this early stage it was not clear when, or if, other time points would be needed. Soil studies were considered desirable both to help evaluate community diversity and assess fire effects on the regeneration process. It was planned to collect soils at each site at two months, one year and two years, dry them out, and hold them for possible testing in later years. Computer analysis of vegetation data was planned, but at what stage this would be done would depend on how quickly the vegetation appeared to regenerate. Vegetation profiles would be drawn at several stages during the project, and a photographic record kept of changes at each site, and all quadrats in each site.

In preparing the project plan, Mary White's pre-fire species lists of vascular plants at various locations in the district were used to evaluate possible plant diversity. From these lists and others, it appeared that heath, dry sclerophyll woodland (heath woodland) and dry sclerophyll open-forest were the three most widespread plant communities of the district. It was decided therefore to put the greatest effort into monitoring these communities. There also appeared to be considerable species diversity in heath and heath woodland communities in different parts of the district, so it was decided to monitor these communities in several locations. For completeness, three other plant communities were included because they were restricted in distribution, vulnerable to disturbance and floristically interesting. These were the closed scrub of the non-saline swamps in the river valleys, the gully communities within open-forest, and the open scrub and heath of the coastal dunes.

The study sites selected were located in

the Angahook-Lorne State Park, the Coastal Reserve, the Alcoa leasehold, and the Ironbark Basin Reserve near Point Addis. Though there were some differences in fire history between sites, essentially all of the areas selected had not been burnt for 10 years prior to the wildfire, and were severely burnt on Ash Wednesday.

The criteria used in selecting the study sites were:

1. they should be on public land
2. pre-fire species lists should be available
3. they should be in areas of native vegetation
4. they should, if possible, be on soils of different geological origin
5. they should have good accessibility by road at all times of year.

It was possible to meet most criteria, though access proved a problem. The fern gully site could only be reached on foot, a 45-minute hike along a walking track, and teams would have to be organised to carry in star pickets and equipment and carry out soil samples. We found later that sites on the Alcoa leasehold were often inaccessible in winter, when the unsealed tracks became impassible and volunteers had to walk 30-40 minutes to sites.

At this early stage the project plan could only be a guide, for it was highly likely that it would need to be modified in time. For example, if it was found that the six plant communities selected were more diverse than anticipated, sampling would need to be increased. This proved to be the case. Initially 60 permanent quadrats were installed at six locations; by the end of the project 120 permanent quadrats were required to sample the plant communities adequately.

Project Funding

Completion of the project plan in May 1983 indicated that the budget estimate for the project over 10 years would be between $15,000 and $20,000. The expensive items were soil analyses, computer analyses and assistance with word processing in preparing papers for publication. The Angair Committee was alarmed by this estimate, because the Society's funding was then quite limited and largely committed to land purchase. The Society was reluctant to embark on financing a long-term project when other conservation priorities might arise.

I suggested Angair apply for external research grants to make the project self-funding, since the Ash Wednesday wildfire had aroused wide interest among environmentalists and grants were available to community groups. The Committee asked me to prepare grant submissions and agreed to fund the project until grants were obtained on the understanding that high cost items (such as soil analyses) were put on hold.

The grant applications were prepared and included expanded project aims which emphasised the positive aspects of a community-based project. The first of these aims was to create local awareness of the unique flora of the Anglesea/Aireys Inlet district by training people to identify local plants. It was also hoped that the project would document the regeneration of the local plant communities following fire, and record the effect of fire on rare plants in the district. The results would then be published in scientific journals so they would be accessible to anyone interested in the flora of the area and provide information to assist in managing the plant communities of this fire-prone area.

The submissions also stressed the competence of the group, in that the project was already underway and had produced results. It also had the input of professional scientists. In addition, the Society kept audited accounts and the project was 'good value for money' in that the amounts sought were small in comparison with the cost of a fully salaried project.

In 1984, grant applications were lodged with the Department of Conservation Forests and Lands (now Department of Natural Resources and Environment) under its 'Grants for Conservation Groups, Special Projects' funding and also with the Myer Fund, The Potter Foundation, and the Native Plants Preservation Society. Each of these four applications were successful, and small grants totalling $9,525 were obtained. The following year further applications were lodged and additional funds of $5,000 were obtained. Later a further $4,000 was donated to the project by the Native Plants Preservation Society. With the funding already received from Angair ($925), the project income stood at $19,550.

This income allowed the project to run for 17 years (from 1983 to 2000). Though

annual expenditure varied, it averaged out at about $1,000 per annum. One policy established from the start was that no salaries or travel expenses would be paid to the volunteers.

Project Organisation

The project was run by a Subcommittee whose function was to control expenditure and see that regular reporting occurred. The Subcommittee had its own project account and audited financial statements were produced annually. Reports on project progress were made monthly to Angair, and regularly to all granting bodies.

As Project Leader, my responsibilities were to plan the project, liaise with consultants, organise the surveys, evaluate and publish the results, prepare reports and grant submissions, oversee training of volunteers and provide feedback. As Deputy Project Leader, Flora Anderson assisted with survey organisation and volunteer training and oversaw publicity. The late Phillip Marriot was responsible for installing, maintaining and locating the permanent and extended plots. He also assisted in survey organisation, volunteer training and analysis of canopy data. Phillip was helped by Ted Faggetter who acted as project Treasurer, site photographer, and carried out the soil fertility bioassays. Jack Hurst, with his wife Ruth, measured and drew the vegetation profiles. Mary White checked plant identifications, liaised with the National Herbarium, Melbourne, and assisted in training volunteers.

Most members of the Subcommittee were retired and lived at Anglesea or Aireys Inlet. They were both willing and able to devote time to the project during the week. This proved invaluable, especially at survey times when much preparation and follow-up was required. The Subcommittee dealt with a wide range of important and trivial issues. These ranged from how could volunteers (especially those over the age of 70 years) be insured, to who would bake the carrot cakes for morning tea at surveys!

The first year - getting underway

The first year was a steep learning curve for everyone and the major challenges were learning to identify the local plants, getting the sampling correct and developing reliable survey techniques.

Plant identification problems

Four Angair members carried out the survey at two months. Learning how to identify the tiny regenerating plants on foliage characteristics alone took many hours of careful observation and comparison. Sending samples to the Herbarium in Melbourne proved not to be useful, because we could not provide the flowering material, seed and adult foliage they required. It was up to us to gradually work it out ourselves.

With her excellent skills as a field naturalist, Mary White proved invaluable. She tenaciously combed the district comparing specimens until she was absolutely confident of every identification. As we became familiar with the look of the young regenerating plants, with practice, we could eventually identify most species on vegetative characteristics alone. Our recording system was organised so that suspect identifications could be confirmed later when the plants flowered and seeded. Monocotyledons like grasses and sedges were among the most difficult. Over time, we began to compile post-fire species lists for each area.

Sampling difficulties

Most sites were sloping and the quadrats had been laid out along topographic gradients. Even at this early stage, it appeared that there was community variability across most sites. Comparison of site and quadrat species data would confirm later if extra quadrats were needed to improve sampling.

Development of methodology

Gradually the group refined its survey methods. They had to be simple, and the interpretation unambiguous. Questions constantly arose. When was a plant 'in' a quadrat? If a plant sprawled, what was its height? Where did one measure trunk girth in low, multistemmed wind-pruned eucalypts? How could cover-density estimations be made less subjective? It became obvious that illustrated instruction sheets were needed. Interpretation problems were discussed with David Ashton and instruction sheets prepared.

The two-month survey was in fact little different to all subsequent ones in that questions constantly arose and problems had to be solved. Questions changed as the vegetation grew and thickened up, and as the knowledge and ability of the volunteers increased. In later years queries included - what do we do if the cover density adds up to more than 100% or, how can we measure the canopy height when we can't get a line of sight anywhere along a contour?

First project review and modification of project plan

The project was first reviewed by David Ashton six months after the fire. He spent two days in the field with Angair members and visited the sites for the first time. The data, which had been collected in the first six months, was reviewed and it was confirmed that extra quadrats must be installed before the spring (eight month survey). It was also decided that extra plots would be required at a later stage if data analysis at 12 months indicated that sampling was still light.

Need to expand the group

By six months, we could see that there was going to be an amazing floral display during the spring months. Dozens of species of lilies, irises, orchids, herbs and grasses had appeared and were in bud.

Interest in the project increased and, by the eight month survey, a total of 15 Angair members was involved. Most were unfamiliar with the plants. Quadrat work was carried out in groups each with a leader responsible for plant identification. The survey went well, but revealed two potential problems: a lack of people skilled in plant identification and a labour force probably too small to cope with the future work load.

Though the Angair group was very keen, few people could still confidently identify the local plants, or had experience with field work. Questions were innumerable, and the experienced members were constantly being called away from the quadrats they were working on to answer queries. In future, at least one experienced person would need to circulate during the survey, to answer questions and help solve problems. There were just not enough experts to go round.

It was also apparent that the vegetation was regenerating very rapidly and dozens of 'new' species appearing each month. By the next survey, one year post-fire, a larger and more expert group of volunteers would be required to handle the work load. It was also clear that more training of Angair volunteers was required and that the Society must recruit skills from outside its membership.

Strategies for recruitment

It was decided to try and recruit more volunteers from Melbourne and Geelong by approaching friends in the Australian Plants Society and the Field Naturalists Club of Victoria. It seemed that the most likely way to build a skilled enthusiastic team would be to go to special interest groups like these, rather than advertise more generally. The project was also publicised among staff and students at the Botany School at the University of Melbourne.

To maintain interest, and help induct and train new volunteers, it was also decided that, in the future, a training day ('Plant Identification Day') would be held out of doors one month before each survey at which anyone interested in the project could participate. Some survey sites would be visited, and there would be an opportunity to picnic in the bush and learn from experts how to identify local native plants. It would provide an opportunity for everyone to 'get their eye in' before surveys, familiarise themselves with the survey methods, and hear about project progress. The training days and survey details would be publicised together, and the first training day was scheduled for a month before the one year survey.

Later years – expanding the group

Training

The first training day attracted 20 people, many coming from Melbourne. Everyone who came was given a set of reference material to keep. This included the total vascular plant list for the district, sets of all work sheets, and instruction sheets explaining survey methods. (There were eight different sets of work sheets each for a plant community. Each set listed all the plants and had columns for data recording.) The group visited the sites (or areas similar to them), progress was reported,

Fig. 1. Angair members Frank Feltham and Therese Turner monitoring vegetation regeneration in coastal sand dunes near Anglesea, Victoria, two years after the 1983 Ash Wednesday wildfires. Photo by Margaret Wark.

survey techniques explained, and volunteers were shown (by Mary White and the Project Leader) how to identify local plants using field characteristics. There was an informal lunch time speaker who talked about the local plants, birds, animals, geology, or a related topic.

To reinforce the training, sets of illustrated information sheets describing the native plants of the district were prepared over the years. Two new sets were distributed each training day. Each set featured a different plant family, explained its characteristics, described the local genera and species in the family and the plant communities in which they occurred. These information sets were initially prepared by the Project Leader, and later on members and friends from the Australian Plant Society groups helped. By the end of the project, sets had been prepared on all vascular plant families except Orchidaceae, which was undergoing taxonomic review.

Recruitment, maintaining motivation and momentum

The first training day went smoothly, and the one year survey saw expansion of the group beyond Angair. The strategy of promoting the surveys to people with botanical or field naturalist interests worked well, and in later years the project was never short of field workers as the word spread. Many of these new recruits added skills and expertise and many brought their friends. As many of the volunteers knew Angair members, this added a pleasant social element to the study.

Some 25 volunteers participated in the one year survey. In this, as in later years, about 20% of the workforce were local residents and the other 80% of the volunteers came down from Melbourne for the day or weekend – a 240 km round trip. About 25% of all volunteers were members of Angair.

New volunteers were attracted to the study because it was promoted as an enjoyable outdoor activity, and presented an opportunity to learn about the plants of the district (see Front Cover and Fig. 1). For local residents and Angair members with homes or holiday homes in the area, it was also the opportunity to participate in a community project where outcomes appeared both positive and constructive, after the appalling destruction of Ash Wednesday. Angair members with homes

in the district provided accommodation for field workers from Melbourne, and often socialised on the Saturday evening at one of the local restaurants.

Momentum was maintained by continuous feedback to the volunteers, all of whom received a handwritten thank you letter after each survey together with a photo of themselves in action. They also received copies of all interim reports and final papers.

As another way of sustaining interest, experts were invited to Anglesea for a weekend between surveys to give an evening talk to Angair about Australian vegetation and to visit the study sites. Experts included David Ashton, the late Dr Jim Willis, the late 'Budge' Bleakley, and Leon Costermans. Their visits always included one or two field days in which Angair members and their friends could participate.

The surveys and training days were always advertised well in advance, and a mailing list and phone booking system was instituted. By the end of the project it was found, to the Subcommittee's amazement, that over 150 people had participated in the field work or contributed to the project in some way during the first 10 years. Ages of volunteers ranged from 14-80, excluding babies and toddlers in back packs. There was a core group of volunteers who remained throughout the life of the project. This group was very highly motivated and, as their expertise increased, they put more and more into the project, often making extra observations and comments or suggestions which helped our understanding or resulted in improved accuracy or efficiency. In later years, groups of up to 40 volunteers worked on each day of a survey. The logistics of handling larger numbers was quite difficult.

Surveys were never cancelled because of bad weather, and often field workers worked in difficult and wet conditions, umbrellas covering their work sheets. Long sleeves and eye protection were needed in later years when pushing through dense stands of Prickly Moses Wattle *Acacia verticillata* in the forest communities. Similar difficulties were encountered in the swamps where the dense stands of Scented Paperbark *Melaleuca squarrosa* bound together by climbing rushes and ferns became almost impenetrable.

Survey organisation

Volunteers were insured either through the Department of Natural Resources and Environment or the Australian Conservation Trust for Volunteers. Care was taken to see that there was someone with medical or nursing qualifications present at each survey. Only two incidents occurred in the 10 years of field work. They were grazing of a shin on a short star picket marking one of the extended plots, and an allergic reaction to a jumper-ant bite. First aid kits were always on hand.

The Project Leader and her Deputy decided work allocation. Care was taken to combine in work groups people with complementary skills and compatible personalities. Everyone was part of a group, and each person within that group had a specific task suited to their ability. Each group had its own set of equipment, as well as a site plan, work sheets, instruction sheets and plant lists. Stools and kneeling mats were provided for quadrat workers as was morning tea. Groups were encouraged to take an hour for lunch and to socialise. As on the training days, there was often an informal lunch time talk on a topic linked to the survey. Subjects included local animals, insects, birds, geology and soils, cinnamon fungus infestation, rare plants of the district, and mosses, lichens and liverworts.

Canopy measurements were carried out by a group of four 'tree people' led by Phillip Marriot. Understorey recovery was monitored by several groups of 'quadrat people'. Each group consisted of a 'plant identifier', a 'recorder', and one or two helpers who assisted in counting and measuring. All unknown species were collected for identification later. The Project Leader circulated between groups answering questions and checking identifications. At each survey Mary White independently compiled a total site list of plants and also assisted with plant identification. Quadrat groups were encouraged to take their time, and ask questions, and were never allocated more than three or four plots per day.

About 400 species of local native vascular plants were monitored during the 10

year study. (This was about 60% of the total indigenous vascular flora of the district.) As 90-100% of all species appeared in the first two years, volunteers had to learn many species quickly. In early years, up to 50 different species could be present in a 1 × 2 m quadrat. Very careful observation was required, for some plants, such as Pygmy Sundew, were less than 1 cm tall when mature, and could easily be missed.

When groups finished their allocated quadrats, they often participated in other tasks such as canopy mapping. At one survey, two Venturer Scouts (working toward their environment badge) obtained in a couple of hours quantitative data on the percentage of *Xanthorrhoea australis* which resprouted following the fire and subsequently died due to Cinnamon Fungus *Phytophthora cinnamomi* infection.

Data was collated immediately after each survey and checked for errors or inconsistencies. The plots were revisited within one week to collect any missing data or check misidentifications. Estimation of percentage cover (cover-density) often proved difficult and it was sometimes necessary to repeat all cover density estimations so as to eliminate major inconsistencies in interpretation.

When it was confirmed that all species present before the fire had reappeared by year three, it was decided that further monitoring would only be carried out in spring at seven and 10 years post-fire.

During the interim years, project documentation began, and one progress paper was written and published (Wark *et al.* 1987). Some informal monitoring was done, and one reunion training day was held at year five to thank the group and distribute copies of Angair's first paper from the study.

Regular site surveillance was needed between years three and 10 and this was carried out by Phillip Marriot and Ted Faggetter, who checked and replaced quadrat posts and tree tags, and located and marked all plots before the seven and 10 year surveys.

Other technical and professional support

Huge carpets of mosses and liverworts appeared at the forest sites at six months and it seemed desirable to monitor these also. Angair had no lists of, or skills at identifying non-vascular plants and Arthur Theis suggested we contact the late Dr George Scott (Reader in Botany, Department of Botany, Monash University) who agreed to be the project's Honorary Consultant on mosses, liverworts and lichens, and to identify all species collected. About 70 species of mosses, liverworts and lichens were collected and identified over 10 years. One moss was a species new to science.

During the second year, signs of Cinnamon Fungus infestation were observed and Dr Gretna Weste (Reader in Plant Pathology, Botany School, University of Melbourne) was contacted for advice. She showed Angair how to collect soil and plant samples and arrange for these to be tested for the presence of the pathogen by Dr G.F. Marks (Department of Forests, Conservation and Lands, Kew, Victoria). He confirmed that Cinnamon Fungus was present. Dr Weste advised how we could minimise pathogen spread, and became actively involved in the fieldwork for the remainder of the study.

By the third year (when all pre-fire species had reappeared) we could see that there appeared to be several distinct plant communities at each site. One of David Ashton's PhD students (Dr David Robertson, Department of Applied Science, Charles Sturt University, Wagga), was approached to carry out computer analyses of year one and three floristic data. He agreed and showed that there were indeed many floristically distinct plant subcommunities at each survey site, and that these plant communities were both species-rich and diverse.

By the third year, when funds were available, chemical analyses of soils collected earlier were carried out by Austin Brown at the State Chemistry Laboratory, Melbourne. These analyses confirmed the wide diversity of soil types in the district.

Data analyses and writing up

All data collection and sorting was done manually; in retrospect this was extremely cumbersome, and if the project was to be repeated today computer techniques would be used. Manual collection made it easy to go back and recheck records, but did generate a huge amount of paper. By the time

the project fieldwork was finished (year 10), project records filled a small room.

Data sorting, data analysis and writing up was my responsibility and took a further five years, due both to limited time and, in part, to long delays (two years or more) in the review and publication process. Draft manuscripts were read by David Ashton and Gretna Weste and their guidance and knowledge of the scientific literature was extremely helpful.

Findings

Though this paper is the story of 'how we did it', it seems desirable to briefly summarise some of the key results which were published as four papers between 1987 and 1999.

The project confirmed for Angair that the vegetation of the local area was both extremely diverse (species rich) and resilient to a single summer surface wildfire, and our key findings were:

1. The first signs of vegetation recovery were seen three weeks after the fire.
2. Most plants regenerated by regrowth, some regenerated only from seed, and others by both regrowth and seed.
3. With two exceptions, all species of vascular plants reappeared in the first three years.
4. Most species of non-vascular plants appeared in later years.
5. The species richness of vascular plants decreased with time.
6. Several rare species, as well as a moss new to science (*Campylopus* sp. *nova*) were found.
7. There was spectacular flowering of herbs in the first year.
8. Structural recovery occurred within 7-10 years.
9. Exotic and indigenous species of 'environmental weeds' proliferated and spread following the fire.
10. The soil pathogen *Phytophthora cinnamomi* appeared to survive the wildfire, and infect regenerating plants causing dieback and death.

In two communities (fern gully and swamp thicket), localised peat fires were ignited by the surface wildfire, killing all above-ground and in-ground vegetation. Key findings for these communities were that the previous plant communities never recovered; that there were major changes in vegetation floristics and structure; and that regeneration from seed or spores was the main regeneration strategy.

Conservation implications

All papers published stressed the conservation implications of the results. Copies of all papers and recommendations were sent not only to the granting bodies but to all organisations associated with land management in the Anglesea/Aireys Inlet region, including the Department of Natural Resources and Environment.

Among the conservation implications were that the species richness of vascular plants in heaths and heath woodlands decreases with time post-fire, and to retain species diversity, heath and heath woodland and other dry sclerophyll communities need to be burnt from time to time. Some plant species (which reproduce only from seed shed following fire) may be eliminated from a plant community if a second fire occurs before young plants set seed and re-establish.

Secondly, fire may stimulate the proliferation and spread of 'environmental weeds' which then compete with regenerating native vegetation. Exotic species such as Boneseed *Chrysanthemoides monilifera* subsp. *monilifera*, seed prolifically, and their seed is spread by native birds. Fire may disturb the ecological balance of plant communities, and native shrubs such as Coast Wattle *Acacia longifolia* var. *sophorae* may become invasive and 'weedy'. There is need to implement environmentally appropriate control programmes to reduce the spread of exotic and indigenous species of weeds in the Anglesea/Aireys Inlet region and protect the local flora.

Phytophthora cinnamomi dieback may modify the floristics and structure of plant communities causing reduction in species richness and simplification of vegetation structure. In the Anglesea area there is a need for mapping of *Phytophthora* distribution and investigation of the susceptibility of species which only reproduce vegetatively such as the endemic Anglesea Grevillea, *Grevillea infecunda* which could be eliminated by this pathogen.

Finally, peat fires may cause major

changes in floristics and structure of plant communities threatening the habitat of rare local species such as the Lizard Orchid *Burnettia cuneata*.

Concluding remarks

For groups planning to embark on a long-term project, our experience has shown that certain elements are crucial if a community project is to succeed and produce results. For Angair, the requirements were:

- the idea, and recognising the potential value of the work;
- an expert local naturalist;
- a scientist who could organise the project and document and publish the results;
- expert guidance by professionals;
- an enthusiastic pool of volunteers; and
- stable funding.

Locally, the Angair project served as a positive social and community activity following, as it did, the trauma of the Ash Wednesday wildfire in 1983. It showed how teams of enthusiastic volunteers could be organised and sustained to contribute to a scientific study that continued for ten years. Such long term studies are rare and the scientific data collected has enhanced the credibility of Angair and given it a more effective voice in local conservation issues.

Data collected during the project has been used in Angair submissions to protect the Alcoa leasehold, which was classified as part of the National Estate in 1987, and to protect and acquire for the public significant coastal heath and heath woodland areas between Anglesea and Aireys Inlet. Reservation of these areas was achieved in 1997.

Information collected during the study has increased our knowledge not only of the flora of the Anglesea/Aireys Inlet region but also how it responds to wildfire, and recommendations which could be of use in planning of conservation management have been sent to DNRE. It is hoped that these recommendations will be implemented when the management plans for the coastal heathlands incorporated into the Angahook-Lorne State Park are drawn up, and when a management plan for the Alcoa leasehold is put in place.

Postscript – Parallel studies on fauna

'Regeneration' was the theme of the Angair 1983 Spring Nature Show (six months after the fire), and a series of coloured posters were produced explaining the project aims and illustrating how the plant communities were regenerating. After the Nature Show, Dr Barbara Wilson (Senior Lecturer, Department of Biology, Deakin University) approached Angair and suggested her research group collaborate with the vegetation regeneration project. Her special interest was small mammals and she had been working in the district for some years. She offered to monitor small mammal recolonisation of the Angair sites post-fire, and asked if Angair could supply her group with vegetation data and train them in vegetation survey methods.

So began, in late September 1983, the first of three parallel, collaborative studies on the Angair vegetation study sites, which investigated recolonisation of these burnt areas by native fauna. The small mammal studies (which were organised and funded completely separately from the vegetation project) ran for three years and resulted in two papers (Wilson and Moloney 1985a, 1985b) and the Deakin group has continued to work in many other areas of the district during the last 15 years.

Following commencement of the small mammal project, it was suggested that a study of recolonization of the sites by birds be initiated. Angair had a local member, Pauline Reilly, who was an expert and respected ornithologist and who had been involved in production of the 1982 Australian Bird Atlas. She was already studying local bird populations (Reilly 1991a) and agreed to lead a project monitoring bird recolonisation of the Angair sites if she could hand-pick her field workers, and if Angair would pay all project costs. This was agreed and the bird studies commenced in March 1984 and ran for three years, resulting in two papers (Reilly 1985, 1991b).

At the time these faunal studies commenced, David Ashton had a PhD student (Dr Alan Andersen, CSIRO Division of Rangeland and Wildlife Ecology) who was studying ant populations in heathland communities. The vegetation project provided an ideal opportunity to study insect recolonisation of all the sites, and it was suggested that invertebrate sampling be done over a one-year period. Species identification could wait till funding was avail-

able. Dr Alan Yen (Museum of Victoria) and Alan Anderson agreed to collaborate and setting of pitfall traps and sampling of insects in the air, in litter and on vegetation, was carried out in October 1984. I prepared a grant submission for Angair which was submitted to the Commonwealth Government Department of Arts, Heritage and the Environment, and in October 1986 a grant of about $8,500 was obtained to fund the identification work. Alan Andersen was employed for six months to carry out the project under the supervision of Alan Yen, Joan Forster and Mary White. One publication resulted (Andersen 1987).

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One Hundred Years Ago

A TRIP TO ANGLESEA RIVER

by H.T. Tisdall

(*Read before the Field Naturalists' Club of Victoria, 10th April,* 1900.)

"As the road nears Anglesea it dips down several hundred feet through well-timbered country. We found the Anglesea River to be a pretty sheet of water, from fifty to sixty yards broad, but barely two miles long. Rowing up the river we soon came to a full stop where the estuary commences in a number of small freshwater streams. The ground between the streams is very soft, being composed of a rich dark soil, thoroughly soaked with moisture, but the growth of the plants in this soil is perfectly marvellous. I measured specimens of the common Coral Fern, *Gleichenia circinata*, nearly twenty feet high. The principal shrubs were Cassinia and other species of Compositæ, the Hazel, *Pomaderris apetala*, with *Pultenæa daphnoides*. The greater mass of Tea-tree was *Leptospermum scoparium*, which was in full bloom. Anything like the mosquitos I had never seen; they were simply in clouds, and of the largest size—in fact, we had finally to decamp from the land into the boat. I was surprised to find bushes of that prickly Proteacean, *Persoonia juniperina*, so near the coast, as I had hitherto thought that it was confined to the Gippsland hills. Huge clumps of reeds, *Lepidosperma gladiatum*, are to be seen on both sides of the river."

From *The Victorian Naturalist* **XVII**, June 1900.